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NOTICE OF ALLOWANCE AND FEE(S) DUE

7590	06/03/2004	
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One World Trade Center Suite 1600		
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Portland, OR 97204-2988		

EXAMINER
PATEL, HARESH N

ART UNIT	PAPER NUMBER
2154	

DATE MAILED: 06/03/2004

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/602,300	06/23/2000	G. Eric Engstrom	3382-55510	1178

TITLE OF INVENTION: APPLICATION PROGRAMMING INTERFACE ENABLING APPLICATION PROGRAMS TO GROUP CODE AND DATA TO CONTROL ALLOCATION OF PHYSICAL MEMORY IN A VIRTUAL MEMORY SYSTEM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1330	$0	$1330	09/03/2004

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status is changed, pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above and notify the United States Patent and Trademark Office of the change in status, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check the box below and enclose the PUBLICATION FEE and 1/2 the ISSUE FEE shown above.

❑ Applicant claims SMALL ENTITY status.
See 37 CFR 1.27.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 11/03) Approved for use through 04/30/2004.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: <u>Mail</u>

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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

    7590   06/03/2004

KLARQUIST SPARKMAN CAMPBELL
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One World Trade Center Suite 1600
121 S W Salmon Street
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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/602,300	06/23/2000	G. Eric Engstrom	3382-55510	1178

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nonprovisional	NO	$1330	$0	$1330	09/03/2004

EXAMINER	ART UNIT	CLASS-SUBCLASS
PATEL, HARESH N	2154	719-328000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

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3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the USPTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE   (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent);   ❑ individual   ❑ corporation or other private group entity   ❑ government

4a. The following fee(s) are enclosed:

❑ Issue Fee

❑ Publication Fee

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s):

❑ A check in the amount of the fee(s) is enclosed.

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❑ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

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NOTE; The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Alexandria, Virginia 22313-1450.

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Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 606 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 606 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) system (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (703) 305-1383. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

PTOL-85 (Rev. 11/03) Approved for use through 04/30/2004.

	Application No.	Applicant(s)
Notice of Allowability	09/602,300	ENGSTROM ET AL.
	Examiner	Art Unit	
	Haresh Patel	2154	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *3/15/04*.

2. ☒ The allowed claim(s) is/are *1-10 and 20-27*.

3. ☒ The drawings filed on *23 June 2000* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☐ All   b)☐ Some*   c)☐ None   of the:

   1. ☐ Certified copies of the priority documents have been received.

   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

   (a)☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

   1)☐ hereto or 2)☐ to Paper No./Mail Date _____.

   (b)☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)

3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)

6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *8* .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____.

JOHN FOLLANSBEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

EXAMINER'S AMENDMENT

1.   An examiner's amendment to the record appears below. Should the changes and/or

additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR

1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the

payment of the issue fee.

2.   Authorization for this examiner's amendment was given in a telephone interview with

Stephen A Wight on May 14, 2004.

3.   The application has been amended as follows:

This listing of claims replaces all prior versions, and listings, of claims in the application.

Listing of Claims:

1.   (Currently amended) In a multitasking operating system that uses virtual memory
to share physical memory among concurrently executing application programs, a method for
controlling allocation of physical memory comprising:

in response to a <u>program</u> call from an application program[,] other than an operating system,
<u>create a data structure</u> to group <u>said application</u> specified code or data in a group [creating a
structure to group the code or data specified by the application];

monitoring for a not-present interrupt generated <u>by a virtual memory system of said multitasking
operating system</u> in response to <u>a said application</u> request to access any part of the code or <u>the</u>
data in the group; and

when the not-present interrupt occurs for a unit of memory in the group, loading all of the code
or <u>the</u> data in the group that is not already in physical memory into <u>said</u> physical memory from
secondary storage at one time<u>, using a single series of loading operations without further non-
present interrupts being generated by said virtual memory system for another unit of memory in
said group, and said loading</u> including [loading] the unit of memory [for which the not present
interrupt has occurred] and all other units of memory used to store the code or <u>the</u> data in the
group.

2.   (Original) The method of claim 1. wherein the structure includes a linked list structure that links together code or data stored at non-contiguous portions of virtual memory.

3.   (Original) The method of claim 2 wherein the structure links pages of memory associated with the non-contiguous portions of code or data.

4.   (Original) The method of claim 1. further including:
repeating the steps of claim 1 for additional groups of code or data specified by the application.

5.   (Original) The method of claim 4 further including:
repeating the steps of claim I for a group of code or data for another concurrently executing application such that more than one concurrently executing application program has specified at least one group of code or data to be treated as a single piece of memory for loading into physical memory in response to a not-present interrupt.

6.   (Original) The method of claim 1 further including:
when the not-present interrupt occurs, checking whether the interrupt has occurred for a unit of memory in the group by evaluating whether an address of the memory request for which the interrupt occurred is within a series of non-contiguous memory addresses of the group.

7.   (Original) The method of claim 11 further including:
tracking memory accesses to units of memory in the group together such that when a unit of memory in the group is accessed, all of the units of memory in the group are marked as accessed; and
determining which portions of physical memory to swap from physical memory to secondary storage by determining which units of code are marked as accessed, such that units are selected to be swapped from physical memory to secondary storage based on frequency of use or how recently the units of code have been accessed.

8.   (Original) The method of claim 7 further including:
in response to a call from an application program to group specified code or data in a second group, creating a second structure to group the code or data specified by the application;
tracking memory accesses to units of memory in the first and second group such that when a unit of memory in both the first and second group is accessed, all of the units of memory in the first and second group are marked as accessed and the unit of memory in both the first and second group is marked as being accessed twice.

9.   (Original) The method of claim 8
when a block of code or data shared between two or more groups is accessed, marking the block as being accessed n times where n is the number of groups that share the block.

10.   (Original) A computer-readable medium storing instructions for performing the steps of a method recited in claim 1.

11.   (Canceled)

12.   (Canceled)

13.   (Canceled)

14.   (Canceled)

15.   (Canceled)

16.   (Canceled)

17.   (Canceled)

18.   (Canceled)

19.   (Canceled)

20.   (Currently Amended) A computer-readable medium having stored thereon a data
structure used for virtual memory management in a multitasking operating system, comprising:

a series of data fields forming a group for indicating blocks of code or data [associated with]
specified by a program call by] an application to be treated as a single unit for purposes of virtual
memory management, the data fields including a list of memory addresses of the blocks and
sizes of each block in the list;

wherein the data structure is evaluated in a data processing operation to load each of the blocks
into physical memory whenever a not-present interrupt is generated by said virtual memory
system in response to said application request for any memory address referring to a location
included in one of the said blocks[.];

wherein the loading of the blocks into the physical memory is performed at one time, using a
single series of loading operations without further non-present interrupts being generated by said
virtual memory system for another unit of memory in said group.

     21. (Previously Presented) The computer readable medium of claim 20, wherein the list
of memory addresses is an array of pointers to blocks of memory to be placed in the group.

     22. (Previously Presented) The computer readable medium of claim 20, wherein the sizes
of each block in the list is indicated in an array of parameters.

     23. (Previously Presented) The computer readable medium of claim 20, wherein the data
structure is used to derive a linked list structure for keeping track of pages used to store the code
or data associated with the group as specified by the application.

24. (Previously Presented) The method of claim 1 further comprising, in response to a second call from the application program to further add units of memory to the group, adding the units of memory to the data structure as specified by the application.

25. (Previously Presented) The method of claim 1 further comprising, in response to a second call from the application to delete specified units of memory from the group, deleting the units of memory specified by the application from the data structure.

26. (Previously Presented) The method of claim 1 further comprising, in response to a second call from the application to destroy the group, destroying the data structure previously used for creating the group.

27. (Currently Amended) In a multitasking operating system that uses virtual memory to share physical memory among concurrently executing application programs, a virtual memory management system comprising:

means for creating a data structure to group code or data specified by one of the concurrently executing applications in a group, in response to a program call from the application other than an operating system [to create a group of specified code or data];

means for monitoring for a not-present interrupt generated by a virtual memory system of said multitasking operating system in response to a said application request to access any part of the code or the data in the group; and

means for when the not-present interrupt occurs for a unit of memory in the group, loading all of the code or the data in the group that is not already in physical memory into said physical memory from secondary storage at one time, using a single series of loading operations without further non-present interrupts being generated by said virtual memory system for another unit of memory in said group, and said loading including [means for loading] the unit of memory [for which the not present interrupt has occurred] and all other units of memory used to store the code or the data in the group[, when the not-present interrupt occurs for a unit of memory in the group].

DETAILED ACTION

4.   The amendment on May 14, 2004 is noted and made of record.

5.   Claims 1-10, 20-27, are presented for examination. Claims 11-19 are cancelled.

Allowable Subject Matter

6.   Claims 1-10, 20-27, are allowed.

7.   The following is an examiner's statement of reasons for allowance:

Applicant's invention discloses a method, implementation of a data structure stored on a

computer-readable medium and a virtual memory management system for using an application

program call (other than an operating system call) to specify and load a code or data into the

physical memory.

The cited teaching provides an API that enables applications to classify code and data in

a group that is to be loaded into physical memory together whenever an application attempts to

access any part of the code or data in the group. This API enables applications to improve

performance in virtual memory systems because it prevents page faults from being spread out

over time as an application makes read/write requests to code and data. The application specifies

code and data that is part of a group. When the virtual memory system in the operating system

signals a Not present interrupt due to the application's attempt to access code or data in the group

that is not present in physical memory, the API implementation causes all of the code and data in

the group to be loaded into physical memory together, i.e., in a single series of memory loading

operations before the application resumes execution (generation of second not present interrupt).

Thus, the latency of loading code or data from secondary storage is compressed into one period

of time, and from then on, all of the code and data in the group is in physical memory.

The prior arts do not teach an API implementation to cause all of the code and data in the

group to be loaded into physical memory together, i.e., in a single series of memory loading

operations before the application resumes execution. Therefore, the claims are allowable over

the art of record.

Any comments considered necessary by applicant must be submitted no later than the

payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for

Allowance."

Conclusion

8.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Haresh Patel whose telephone number is (703) 605-5234. The

examiner can normally be reached on Monday, Tuesday, Thursday and Friday from 10:00 am to

8:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, John Follansbee, can be reached at (703) 305-8498.

The appropriate fax phone number for the organization where this application or

proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3900.

Haresh Patel

May 23, 2004.

6.   Claims 1-10, 20-27, are allowed.

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Haresh Patel

May 23, 2004.

JOHN FOLLANSBEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100